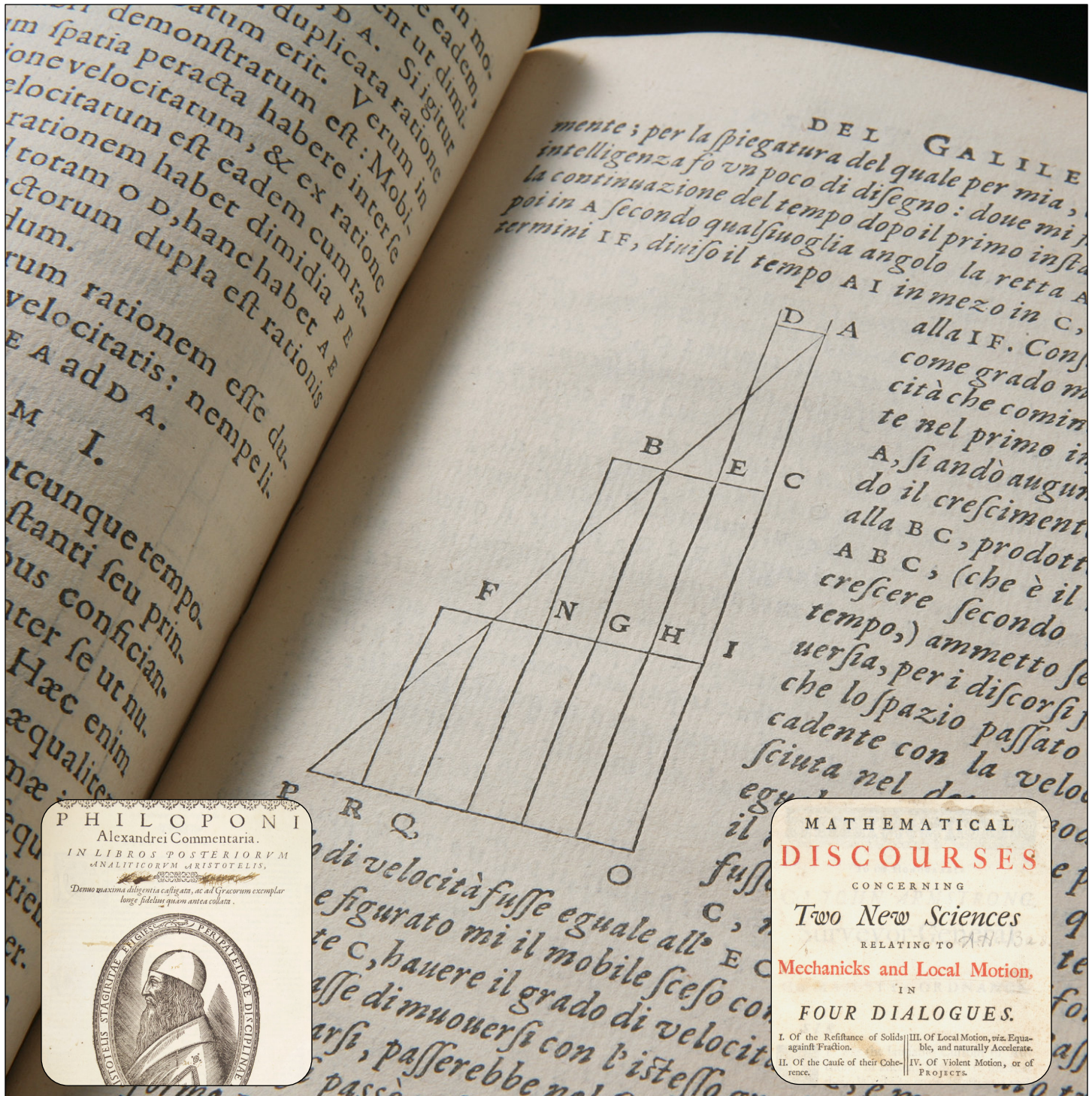


# Inclined Plane Law of Falling Bodies

Learning Leaflet: Instruments & Experiments

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Galileo, *Discorsi e Dimostrazioni Matematiche* ("Discourse on Two New Sciences"; Leiden, 1638)

John Philoponos (1504) and Galileo, *Two New Sciences* (1730)

Exhibit: Galileo's World | Galleries Galileo, Natural History and the Americas, no. 20

Galileo & Microscopy, no. 6

The New Physics, nos. 9, 13, 14, & 15

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Why was variable tilt so important?



## Inclined Plane

### Galileo's Law of Free Fall

Aristotle supposed that the more an object weighs, the faster it will fall. In Athens in the 6th century CE, John Philoponos tested this hypothesis by dropping balls of different weights from a tall height.

Philoponos reported that although heavier objects do reach the ground a little faster, they do not increase in speed according to their weight.

Philoponos initiated a research tradition into what later became known as *impetus* and eventually *inertia*. It was in light of this experimental tradition that Guidobaldo del Monte and other mathematicians of Galileo's world began their investigations in mechanics. The falling bodies experiment of Philoponos is often misattributed to Galileo at the Leaning Tower of Pisa. Rather, Galileo refined the impetus experimental tradition by using an inclined plane to slow down the motion of free fall to speeds which might accurately be measured. The result was an experimental demonstration of Galileo's law of free fall, which remains fundamental to the physics of motion.

### The OU Inclined Plane

Galileo described his experiment with an inclined plane in *Two New Sciences*. Unfortunately, he omitted many details about the plane itself. We asked master craftsman Ron Mitchell to design an inclined plane that would have delighted Galileo. The greatest design challenge was to make the tilt of the beam adjustable. Ron's solution was to employ one of Galileo's favorite simple machines, the balance. In Ron's elegant design, one may slide the massive beam to a desired height with a single hand. The plane was constructed using methods of Venetian shipbuilding. It incorporates design details as described by Galileo, such as the lining the ball channel with vellum.

As an experienced musician, Galileo timed the balls' descent to a 10th of a pulse beat.

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